

## HDR Intra-Cavitary Approaches to APBI: Basic Physics and Limitations

Presenter: Dorin Todor, Ph.D.

### Abstract

A rationale for Accelerated Partial Breast Irradiation (APBI) will be given together with a brief historical introduction in intra-cavitary modalities, with emphasis on breast. Five different devices will be presented in the intra-cavitary category: four balloon-based ones (MammoSite, MammoSite ML, Contura MLB and Xofigo balloon device) and a strut-based device (SAVI). Devices will be discussed relative to the radioactive sources employed in each case, with advantages and disadvantages and comparisons between them reviewed in a number of published articles.

While TG-43 and its updated version continues to be the bread and butter for everyday computation in HDR brachytherapy, novel modalities using Monte-Carlo methods, as well as the first commercial platform –Acuros –a deterministic Linear Boltzman Transport Equation based method, are emerging and becoming of importance in the clinic. State of the art dose computation for APBI will be presented and pertinent published literature will be reviewed.

Elements of NSABP B39 / RTOG 0413 protocol will be introduced, emphasizing the definition of structures used for planning and evaluation of APBI, together with dosimetric parameters defining treatment appropriateness. Since some of the latest devices contributing on the intra-cavitary APBI arena were not available when the Randomized Phase III Study started accruing patients, updates and comments will be presented relative to the pertinence of the limiting dosimetric parameters previously defined for current treatment plans.

Next, a number of interesting topics will be presented: Dose perturbations due to contrast medium and air, Probabilistic aspects of brachytherapy treatments, The effect of patient inhomogeneities, Dose to skin, Chest wall dose, allowing the audience to become comfortable with these somehow more difficult issues.

At last, a brief presentation of the optimization methods currently used and available, with emphasis on platform dependency and efficiency. A comprehensive view of the Quality Assurance methods employed for APBI treatments will wrap-up the Intra-cavitary APBI presentation.